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(71) Applicant
Alps Electric Co Ltd (Japan),
1-7 Yukigaya, Otsuka-cho, Ota-ku, Tokyo 145, Japan

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(72) Inventor
Shigeru Nigorikawa

(74) Agent and/or Address for Service
Michael A Enskat & Co,
69 Belmont Road, Uxbridge, Middlesex UB8 1QU

(54) Case for electronic devices

(57) A case for an electronic device includes a frame (11) of metal sheet including an opening (11b) and having corners around the opening (11b) and recesses (11d, 11e) adjacent to the corners, and a circuit board (13) inserted in the frame (11) through the opening (11b) and having edges soldered to the corners. When the edges of the circuit board (13) are soldered to the corners as in a solder bath, a gas leaks out through the recesses (11d, 11e) and solder flows well due to the recesses. An optimum quantity of solder is deposited on each of the corners so that the solder masses (16) will be finished well.

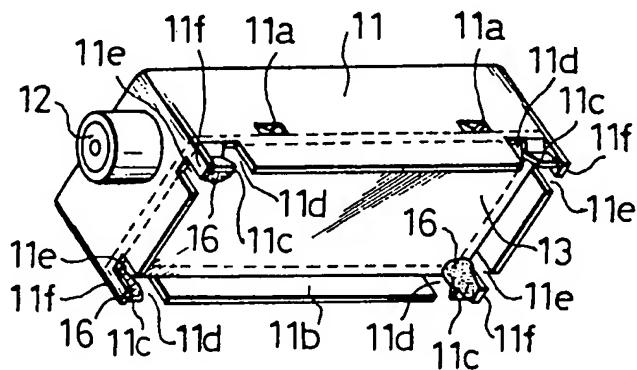
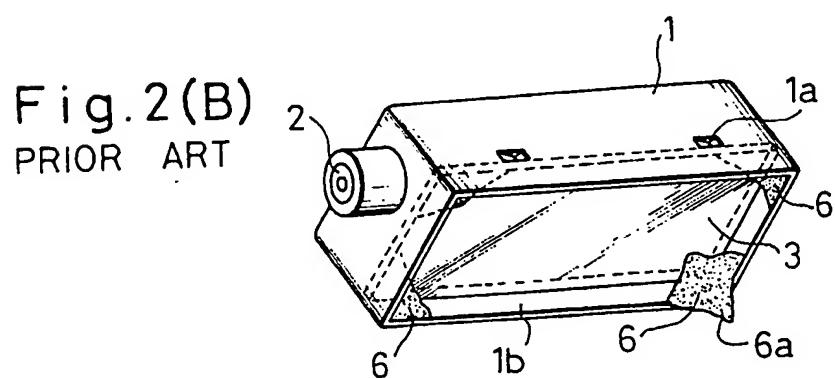
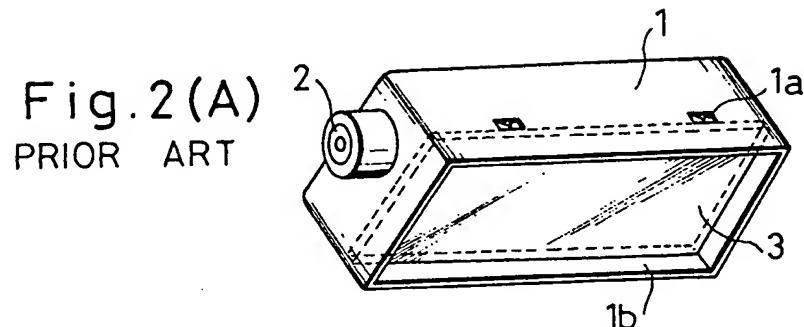
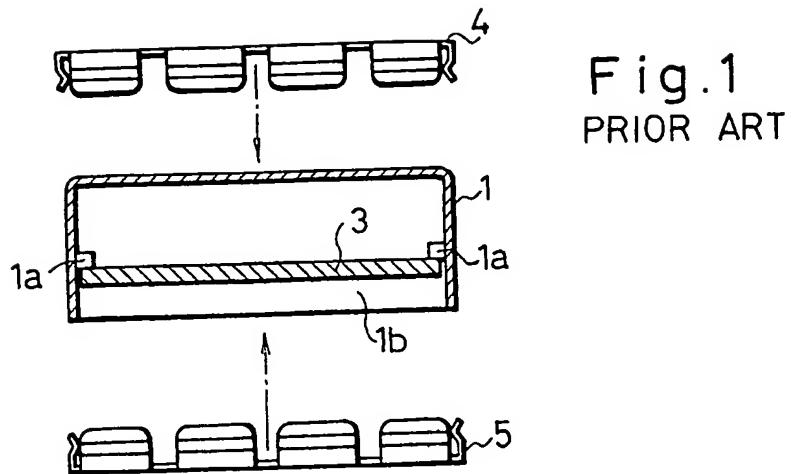


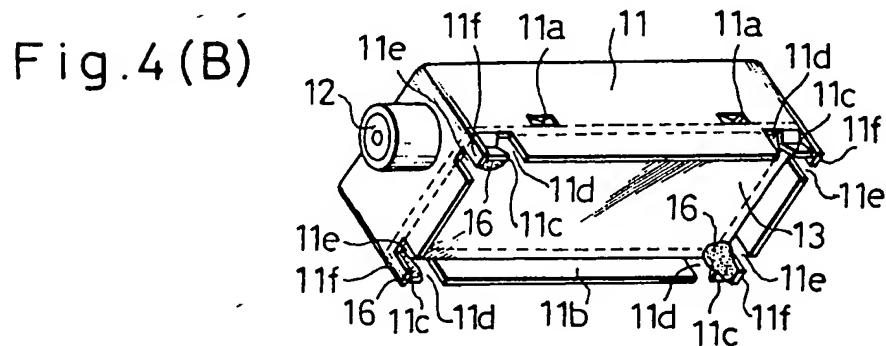
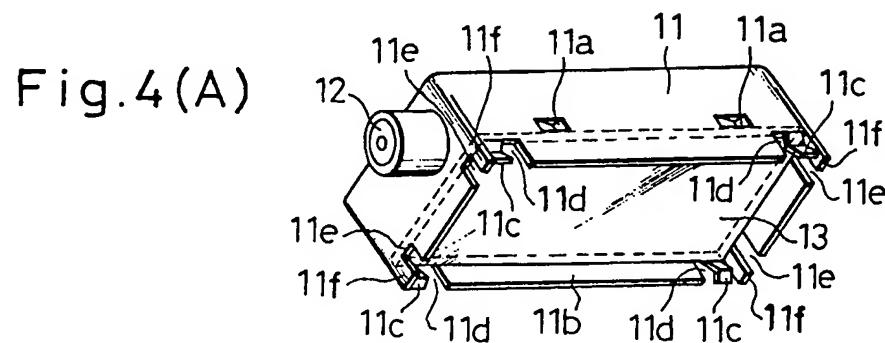
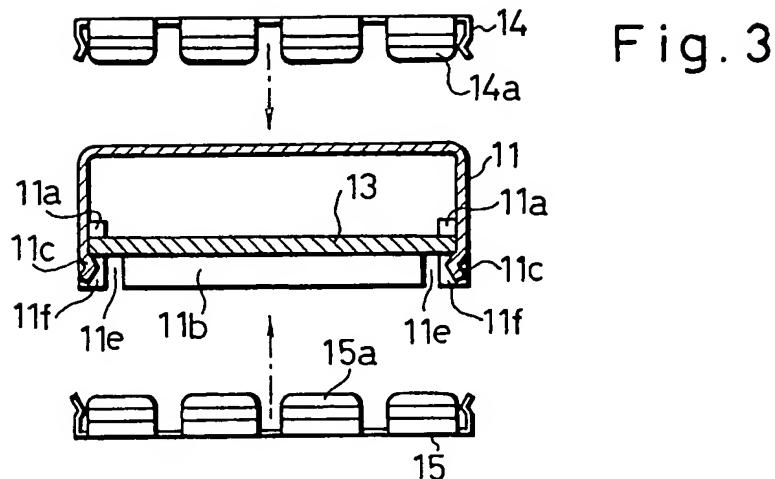
Fig.4(B)

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SPECIFICATION**Case for electronic devices**

5 The present invention relates to an electronic device such as an RF modulator or an FM tuner, and more particularly to a case for such an electronic case, in which a circuit board and a frame can reliably be soldered to each
 10 other.

Fig. 1 of the accompanying drawings shows in cross section of a conventional case for an electronic device, and Figs. 2(A) and 2(B) are illustrative in perspective of a construction by
 15 which a circuit board is fixed to a frame.

Designated at 1 in Figs. 1, 2(A) and 2(B) is a frame made of a thin metal sheet. The frame 1 has two locking projections 1a on each of two side surfaces thereof, the locking
 20 projections 1a projecting into the frame 1. An input and output contact plug 2 is secured on another side surface of the frame 1. Circuit components accommodated in the case are mounted on a circuit board 3, which will be
 25 inserted in the frame 1 through an opening therein and engaged in placed by the locking projections 1a. Covers 4, 5 are fitted respectively over upper and lower ends of the frame 1 so that the circuit on the circuit board 3 will
 30 be shielded.

When the circuit board 3 is to be placed in the frame 1, the circuit board 3 is inserted into the frame 1 through the opening 1b until the circuit board 3 is engaged by the locking
 35 projections 1a. Edges of the circuit board 3 are then soldered to inner corners of the frame 1 as shown in Fig. 2(B).

For automatically soldering the circuit board 3 to the frame 1 for an increased efficiency, it
 40 is ideal to utilize a solder bath for dip soldering. In dip soldering, the circuit board 3 is required to be temporarily retained in the frame 1 when the case is taken into the solder bath. However, since the conventional case
 45 construction has no means for securing the circuit board 3 in the frame 1, automatic soldering operation using the solder bath is difficult to be applied to the prior case construction.

50 Where the frame 1 has any means for temporarily securing the circuit board 3 in the frame 1 and they are secured to each other by dip soldering using the solder bath, a gas produced by the solder and flux is trapped in
 55 the opening 1b in the frame 1 and poor soldering results when the frame 1 is placed in the solder bath. The solder does not flow well in the closed opening 1b in the frame 1. Therefore, a large quantity of solder 6 is
 60 deposited on the corners of the frame 1 where the solder is easy to deposit, and some of the deposited solder 6 forms projecting icicles 6a. When such soldering defects are produced, a wiring pattern on the reverse side of the
 65 circuit board 3 tends to be short-circuited,

resulting in a less reliable circuit. The frame 1 and the cover 5 are not kept in good electric contact, thus adversely affecting the shielding capability.

70 **SUMMARY OF THE INVENTION**
 With the above conventional problems in view, it is an object of the present invention to provide a case for electronic devices which
 75 is free from undesired soldering deficiencies at the time a circuit board is soldered in and to a frame.

According to the present invention, a case for an electronic device includes a frame of
 80 metal sheet including an opening and having corners around the opening and recesses adjacent to the corners, and a circuit board inserted in the frame through the opening and having edges soldered to the corners. When
 85 the edges of the circuit board are soldered to the corners as in a solder bath, a gas leaks out through the recesses, and solder flows well due to the recesses. An optimum quantity of solder is deposited on each of the corners
 90 so that the solder masses will be finished well.

The above and other objects, features and advantages of the present invention will become more apparent from the following description when taken in conjunction with the
 95 accompanying drawings in which a preferred embodiment of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

100 Figure 1 is an exploded side elevational view, partly in cross section, of a conventional case for electronic devices;

Figures 2(A) and 3(B) are perspective views of a frame of the case shown in Fig. 1 with an
 105 opening disposed below;

Figure 3 is an exploded side elevational view, partly in cross section, of a case for electronic devices according to the present invention;

110 Figures 4(A) and 4(B) are perspective views of a frame of the case of Fig. 3 with an opening disposed below.

DESCRIPTION OF THE PREFERRED EMBODIMENT

115 A case according to the present invention serves to shield high-frequency devices such as RF modulators and FM tuners, and includes a frame 11 made of a thin metal sheet
 120 bent to contour. The frame 11 includes two sides each having two locking projections 11a formed by pressing the side into the interior of the frame 11. The frame 11 also includes support members 11c on the corners of an

125 opening 11b in the frame 11. The support members 11c are resiliently deformable at the ends of the two sides of the frame 11. The two sides of the frame 11 have recesses 11d defined adjacent to the support members 11c.
 130 The frame 11 also includes other two sides

each having fixing members 11f adjacent to the support members 11c and recesses 11e defined adjacent to the fixing members 11f. Thus, each corner of the opening 11b in the frame 11 has the support member 11c and the fixing member 11f disposed between the two recesses 11d, 11e.

One of the sides of the frame 11 supports thereon an input and output contact plug 12.

10 A circuit board 13 is disposed in the frame 11 and supports thereon circuit components. The circuit board 13 is sandwiched between the locking projections 11a and the support members 11c within the frame 11, and has 15 edges fixed by solder masses 16 to the support members 11c and the fixing members 11f.

As illustrated in Fig. 3, a cover 14 is fitted over an upper end of the frame 11 while a 20 cover 15 is fitted over a lower end of the frame 11. The covers 14, 15 have locking tabs 14a, 15a bent from edges thereof. The covers 14, 15 are fixedly mounted on the frame 11 with the locking tabs 14a, 15a 25 fitted over outer peripheral surfaces of the frame 11.

The case of the present invention will be assembled in the following manner:

For securing the circuit board 13 in the frame 11, the circuit board 13 is inserted into the frame 11 through the opening 11b. At this time, the support members 11c are resiliently deformed so that the edges of the circuit board 13 will be sandwiched and temporarily 35 secured between the locking projections 11a and the support members 11c. After the circuit board 13 has been temporarily fastened in position, the frame 11 is brought into a solder bath, whereupon masses 16 of solder 40 are deposited on the corners of the opening in the frame 11 so that the circuit board 13 is soldered to the frame 11.

As the frame 11 is taken into the solder bath, a gas generated by the solder and flux 45 leaks out through the recesses 11d, 11e, and is prevented from being trapped in the frame opening. Therefore, no soldering defects due to the trapped gas are prevented from occurring. Since the support members 11c and the 50 fixing members 11f are of a small area sandwiched between the recesses 11d, 11e, the solder flows well against the support members 11c and the fixing members 11f, on which the optimum quantity of solder 16 is deposited. Because the support members 11c and the fixing members 11f are separated from other frame portions by the recesses 11d, 55 11e, the amount of heat radiated from the solder masses deposited on the members 11c, 11f is reduced to a minimum. Accordingly, the solder masses 16 are finished well, with no solder icicles 6a (Fig. 2(B)) being produced.

The solder masses 16 can also be finished 65 well when they are deposited manually rather

than in the solder bath.

The present invention has the following advantages:

(1) The recesses are defined in the vicinity 70 of the corners of the opening in the frame, and the edges of the circuit board are soldered to the corners. The amount of heat radiated from the solder masses deposited on the corners is held to a minimum because of the recesses, and the solder masses are finished well. Therefore, no soldering deficiencies and hence no solder icicles are formed. Where dip soldering is utilized, a gas generated from the solder and flux leaks through 75 the recesses, and the solder flows well against the support member, with the result that an optimum amount of solder is deposited well. With the solder masses finished well, the frame and the covers are in good contact 80 providing a good shielding capability. Furthermore, no wiring pattern on the circuit board is short-circuited.

(2) With the circuit board resiliently engaged by the support member of the frame, 90 the circuit board can be soldered to the frame while the circuit board is being temporarily secured to the frame. Consequently, the soldering operation is facilitated, and automatic soldering operation using a solder bath can 95 also be utilized.

Although a certain preferred embodiment has been shown and described, it should be understood that many changes and modifications may be made therein without departing 100 from the scope of the appended claims.

CLAIMS

1. A case for an electronic device, comprising:

105 (a) a frame of metal sheet including an opening and having corners around said opening and recesses adjacent to said corners; and
 (b) a circuit board inserted in said frame through said opening and having edges soldered to said corners.

110 2. A case according to claim 1, wherein said corners comprise resilient support members for temporarily securing said circuit board to said frame.

115 3. A housing for an electronic device substantially as hereinbefore described, with reference to Figs. 3 and 4 of the accompanying drawings.

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